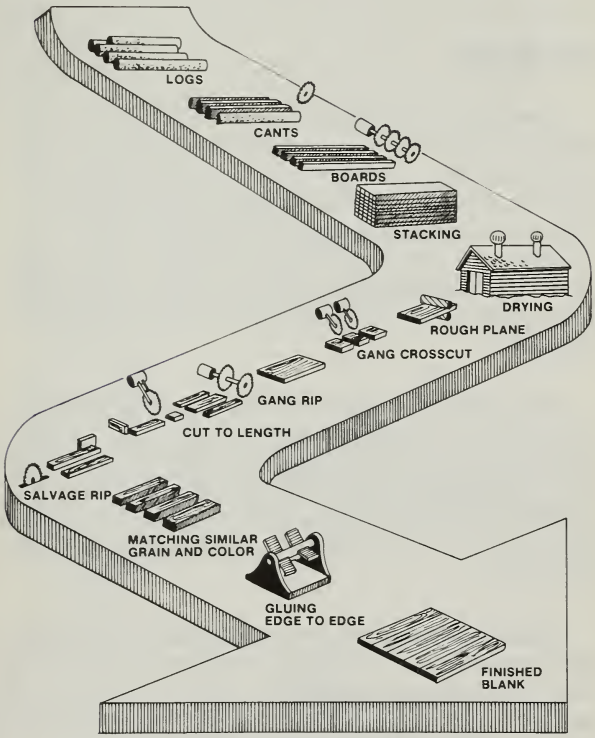
New Technology for Using Low-Grade Hardwoods: System 6



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New Technology for Using Low-Grade Hardwoods: System 6

by Hugh W. Reynolds and Charles J. Gatchell

Introduction

Only the best hardwood lumber is presently used to make the solid wood parts in high-valued products such as furniture and kitchen cabinets. Hardwood forests do not yield enough large, high-quality logs, and this causes shortages of high-quality lumber. Although we are growing more hardwood timber than we are cutting, the surplus is in small-diameter, low-quality trees. These small trees cannot, in general, be sawed into standard lumber profitably.

But small trees can be raw material for the furniture and cabinet industries if we use new technology and a new intermediate product. The new technology we call System 6; the new product is called standard-size blanks (Fig. 1). Together they can make conversion of the low-grade hardwood resource profitable and relieve the shortage of hardwoods.

Standard blanks have been developed by Araman[1] from an analysis of the rough part sizes required by 32 major manufacturers of kitchen cabinets and furniture. A standard blank is a piece of solid wood (it may be made from narrow pieces edge-glued together) of a predetermined length, width, thickness, and quality. These blanks may be processed efficiently into the needed rough parts by simply ripping and crosscutting with a very small loss in kerf and end trim.

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[1]Araman, Philip A.; Gatchell, Charles J.; and Reynolds, Hugh W. Meeting the solid wood needs of the furniture and cabinet industries: standard-size hardwood blanks. Res. Pap. NE-494. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1982. 27 p.

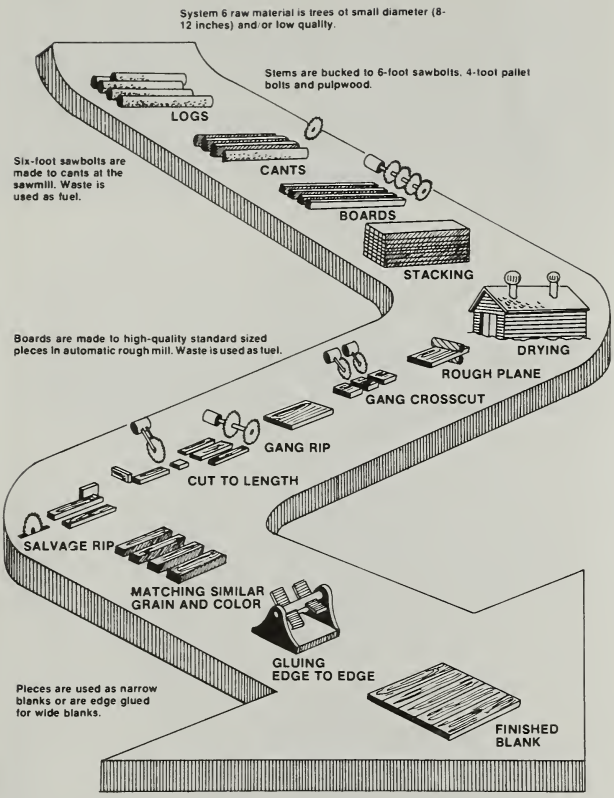

Figure 1.—System 6 begins with logs and ends with blanks.

Details of System 6 Technology

The details of System 6 have been developed from numerous trials at our Methods Testing Plant at Princeton, West Virginia.[2] Several manufacturers of furniture and kitchen cabinets have tried System 6 blanks and have found them satisfactory for the production of fine solid wood products. For System 6 to give the best results, seven sequential steps must be followed:

1. Divide the low-grade hardwood resource into different roundwood products.
2. Saw bolts suitable for System 6 into cants, not lumber.
3. Use automated cant sawing to make boards.
4. Use the best drying practices.
5. Remove most of the defects with automated cut-up.
6. Bring pieces to specified size and quality with manual cut-up.
7. Make standard-size blanks as the final product of the System 6 rough mill.

Details of these seven steps are:

Step 1: Divide the low-grade hardwood resource into different roundwood products. To make maximum use of the small-diameter, low-grade hardwood resource, all timber that meets the System 6 bolt criteria sould be used for System 6. The remainder should be used for less valuable roundwood products, such as pallet bolts, pulpwood, and firewood.

The System 6 bolt criteria are:

Minimum length:	6 feet nominal; 75 inches actual or 8 feet nominal; 99 inches actual
Sweep:	1½ inches maximum, any diameter
Diameter:	8-through 12-inch diameter class (7.6 inches minimum to 12.5 inches

[2]Reynolds, Hugh W.; and Gatchell, Charles J. New technology for low-grade hardwood utilization: System 6. Res. Pap. NE-504. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1982. 8 p.

	maximum diameter inside bark on small end)
Quality:	Sound and solid. Sound defects without limit.

Step 2: Saw System 6 bolts to two-sided cants, not lumber. Sawmills lose money sawing small Factory Grade 3 and poorer logs to lumber. The sawmills must make a different product—one that can be produced quickly and easily and sold at a profit. A market analysis[3] shows that circular headrig sawmills should be able to make cants profitably if they use the procedures shown in Figure 2.

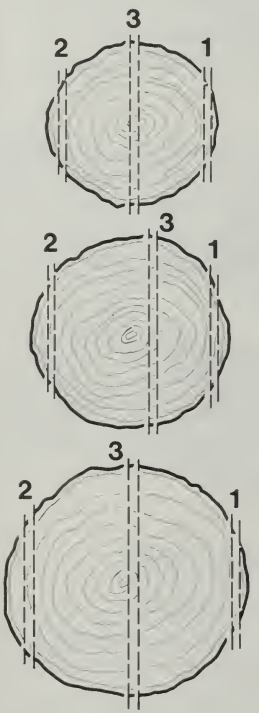

Figure 2.—Sawing System 6 bolts to cants.

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[3]Reynolds, Hugh W.; and Gatchell, Charles J. Marketing low-grade hardwoods for furniture stock—a new approach. Res. Pap. NE-444. Broomall, PA. U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1979. 7 p.

Step 3: Use automated cant sawing to make boards. Circular gang resaws do this well. They are relatively inexpensive, well proven through years of use in the hardwood pallet industry, and provide excellent accuracy. These machines require two flat parallel faces on the wood being sawed. They are ideal for two-sided cants as the two rounded sides do not affect the sawing. Boards that do not have one minimum size (1½ inches wide x 15 inches long) clear area are rejected. All other boards are used.

Step 4: Use the best drying practices. The output of the gang-sawing step is boards that are 3¼ or 4 inches wide, about 6 or 8 feet long, and full of stresses that must be relieved during drying. Proper drying is very important—so important that we recommend stacking straight from the gang saw.

The boards are sticker-stacked in 4x4x6-foot packages, banded with polypropylene strapping, and brought to the air drying yard or forced-air predryer on the day the boards are sawed. Kiln drying schedules that include liberal equalizing and conditioning times will produce boards that are flat and stress-free.

Step 5: Remove the majority of defects with automated cut-up. System 6 processing results in narrow (3¼- or 4-inch) boards of only two lengths (6 or 8 feet). We have developed techniques to get all that is good from the boards rapidly and efficiently by gang crosscutting followed by gang ripping.

Gang crosscutting

A multiple-saw gang crosscut is used to make one to four pieces from each board. The spacing between saws will depend on the lengths of blanks that are to be made. The outer saws are used to trim the ends of those best boards (approximately 10 percent) that contain one full-length cutting. Medium-quality boards (approximately 20 percent) contain a cutting that is long, but less than full length. The outer saws and one inner saw are used to cut these boards to one long piece and one short piece. The remaining 70 percent are low-quality boards. The 6-foot ones are crosscut to three short pieces; the 8-foot ones to four short pieces. Gang crosscutting can be done rapidly by an operator with very little training.

Gang ripping of acceptable pieces

Pieces coming from the gang crosscut saw are accepted if they contain at least a minimum-size cutting (1½ inches wide by shortest blank length to be made). Only one cutting will be made from each piece. To speed processing and make the operator's decisions easier, we recommend cutting-width increments no smaller than ½ inch. In our work, we have standardized on five cutting widths: 1½, 2, 2½, 3, and 3½ inches. Each piece to be gang sawed is inspected to choose its better edge; this edge will be given a ¼-inch dressing cut. Then the piece is placed in one of five pockets on the gang rip table. The ¼-inch edge cut and the width cut to remove defects are made at the same time. Pieces coming from the gang ripsaw have edges of glue-joint quality.

Step 6: Bring pieces to specified size and quality with manual cut-up. After gang crosscutting and gang ripping, the cuttings are in no more than five lengths. There may still be some defects that need removal. A manually controlled crosscut saw is used to remove end defects and cut pieces to blank lengths. A manually controlled glue-joint ripsaw is used for salvage ripcuts when required.

Step 7: Make standard-size blanks as the final products of the System 6 mill. Blanks are made to specified thicknesses, widths, lengths, and qualities, chosen to be the rough size of the most commonly needed parts or multiples of those rough sizes. Blank widths from 1½ to 3½ inches in ½-inch increments work very well for narrow parts, or wider edge-glued blanks can be ripped to the needed sizes.

Summary

Four basic concepts differentiate the new System 6 technology from the techniques conventionally used to convert hardwood tree stems to furniture and kitchen cabinets. These concepts are: (1) a new, nonlumber product called standard-size blanks that is the output of the System 6 process; (2) highly automated rather than manual techniques for converting logs to blanks; (3) total processing of every board that contains a minimum-size cutting; and (4) minimized operator decisions and limited choices.

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